forest MANAGEMENT bulletin

RELEASE CUTTING IN SOUTHERN FORESTS: ECONOMICAL AND EFFECTIVE STAND CONVERSION

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Underplanted loblolly pine released at age 8, 16 months before picture was taken. The average d.b.h. of the dominant pine, at age 18, was 7 inches (17.8 cm).

SUMMARY

Release cutting is the freeing of a tree (pine in our examples) from more immediate competition by cutting, girdling, or use of herbicides to eliminate growth of low-value hardwoods that overtop or closely surround the tree. Increased yields more than pay the cost of release treatments. Research shows that growth of pines may double in 10 years. Timing is important because survival and growth are greatest when release treatments are undertaken at planting. However, trees that have grown beyond the seedling stage also benefit. Release treatments may be particularly helpful in areas of limited rainfall.

IT'S TIME TO TAKE ANOTHER LOOK AT RELEASE CUTTING

Much of the 30 million-plus acres (12.1 million ha.) of oak/pine and some of the 60 million-plus acres (24.3 million ha.) of oak/hickory in the South can be economically and effectively converted to pine by cutting or other release treatments. Much of the pine timber now being harvested in south Arkansas and north Louisiana is the result of release cutting initiated by industry in the late 1940's and early 1950's. Much, indeed, of the second-growth pine on industrial and National Forest holdings all over the South exemplifies successful release cutting. However, with today's emphasis on massive land clearing and intensive culture, plus the growing shortage of skilled labor, young foresters and

Loblolly pine, three growing seasons after underplanting on a blackjack-post oak ridge in north Mississippi. All hardwoods 6 inches (15.2 cm) tall and larger were treated with herbicides in April of the first growing season.

landowners may overlook release cutting as one means to increase the productivity of small forest land holdings.

Twenty or more years ago, many oak-pine and oak-hickory stands had an understory of young pine. Today, becuse of the lack of recent fires, pine seedbed conditions are poorer and competition from seedling and sapling hardwoods is greater. However, periodically following a good seed crop, the floor of oak-pine and oak-hickory stands will be covered with pine seedlings. Following are examples of how the seedlings of the four Southern pines react to release treatments. Although specific States are mentioned, the results cited have implications for improving growth of pines throughout the South.

RESPONSE TO RELEASE TREATMENTS

Loblolly Pine.–This species is the most numerous, aggressive and adaptive of the four southern pines. In north Mississippi, loblolly pine seedlings underplanted in a blackjack-post oak stand were subjected to three degrees of immediate release: overstory only removed; understory only removed; and all hardwoods removed. Three years later, about half the pine seedlings on the first two treatment areas were overtopped despite the 2,4,5-T used on hardwoods; release treatments had to be repeated in these stands. Five-year results are shown in table 1.

Although release treatments are preferable immediately after planting pines under hardwoods, release still very effectively stimulated the growth of loblolly when postponed as long as 8 years (as it was in one north Mississippi stand). Diameter growth of the released pine was 2½ times and height growth 1½ times that of unreleased pine during the 10 years following treatment. In central Mississippi, 13-year-old natural loblolly pines, released at 3 years of age, grew twice as tall as those freed at 8 years, but reached less than half the height of pines planted at the same time in the open.

In central Louisiana, at plantation age 7, pines released at planting time averaged 16 feet (4.9 m) tall – 6.5 feet (2 m) taller than unreleased pines. Where release had been delayed for 1 and 2 years after planting, the pines averaged 1.5 and 3 feet (0.5 and 0.9 m) shorter than those released immediately. Survival averaged 82 percent for seedlings released immediately and 46 percent for those released later or not at all. Most of the difference developed during the first year, which was dry.

After 3 years, underplanted loblolly pines on the Cumberland Plateau in Tennessee were tallest where both understory and overstory competition had been eliminated. Heights averaged 6.2 feet (1.9 m) where silvicide had been used and 4.5 feet (1.4 m) where hardwoods had been simply cut or girdled. The seedlings on unreleased check plots averaged 1.5 feet (0.5 m) tall. Survival at the end of the third growing season was 77 percent on the checks and 89 to 98 percent on the released plots.

In south Arkansas, low-grade hardwoods suppressed 1,200 pine seedlings per acre. These hardwoods ranged from 1 to 20 inches (2.5 to 50.8 cm) d.b.h. and averaged about 4 inches (10 cm). Most of the pines were less than 7 feet (2.1 m) tall and about 4 years old. Only 10 years after release, a light pulpwood thinning was possible in this stand.

Table 1. – Influence of three treatments on the survival and growth of loblolly pines

Treatment	Pine Survival		Average Height of Pines								Average d.b.h.*	
			1956		1957		1958		1960		1960	
	1956 (percent)	1960 (percent)	ft.	m	ft.	m	ft.	m	ft.	m	inches	cm
Overstory removed	90	87	1.2	.37	3.0	.91	5.3	1.6	11.2	3.4	1.5	3.8
Understory removed	86	82	1.1	.34	2.2	.67	4.1	1.2	10.2	3.1	1.3	3.3
All hardwoods removed	95	93	1.5	.46	5.0	1.5	8.8	2.7	15.8	4.8	2.6	6.6

* diameter of trunk at breast height

Shortleaf Pine.–This species was direct seeded on two sites in Missouri: (1) an 80 percent hardwood canopy, and (2) a canopy that had been reduced to 20 percent. At the end of 5 years, 16 percent of the first group and 60 percent of the second group survived; height was 6.2 (15.7 cm) and 33 inches (83.8 cm), respectively.

Release cutting also proved worthwhile for underplanted shortleaf pine seedlings on the Tennessee Cumberland Plateau. Researchers released the seedlings from low-grade hardwoods before their first growing season. These seedlings grew twice as fast in the first season and four times as fast in the second season as did the unreleased seedlings. Release did not improve the survival in the first 2 years.

Slash Pine.–In central Louisiana, researchers underplanted slash pine in a stand of scrub oak and released some immediately, 1 year after planting, 2 years after planting, or not at all. Survival was poor because of a record drought in the first growing season. Results at the end of three growing seasons, listed in order of decreasing immediacy of release, were: survival–46, 36, 31, and 27 percent; height–3.4, 2.3, 2.1, and 1.6 feet (1, 0.7, 0.6, and 0.5 m).

Longleaf Pine.–A study in south Alabama indicates that growth and survival of longleaf pine seedlings suffers where scrub-oak competition is removed later than the end of the first growing season. Release 1 year after germination brought about faster root-collar diameter growth than did more delayed treatment. Four-year-old seedlings that had been released at 1 year of age grew about 56 percent larger in diameter than those never released. Removal of competition when seedlings were 2 years old also appeared more effective than later release. Control of oaks ahead of seedfall permitted herbs and grass to become so firmly established that they replaced the hardwoods as competitors. Fourth-year survival of the pines released after 1 year of growth was 98 percent; that of the unreleased, only 76 percent.

In north Mississippi (where slash and longleaf pine are admittedly too far north), the four species were underplanted and the growth and survival of the released pines compared with that of the unreleased pines. Survival and growth after 10 growing seasons are shown in table 2.

AVAILABILITY OF MOISTURE

Released trees respond not only to increased light, but also to the greater availability of soil moisture. However, release treatments may benefit weeds as well as pines, and result in continued competition for the available water. Where all the hardwoods had been removed in north Mississippi, a great increase in annual vegetation depleted much of the moisture in the top 12 inches (30.5 cm) of soil. This loss occurred as rapidly as losses at sites where only the overstory had been controlled. Overstory vegetation appears to draw more moisture from the upper soil zones than does the understory. At depths of 2 to 4 feet (0.6 to 1.2 m), no difference could be noted in the amounts of moisture removed by overstory and understory. The results of this study indicate that moisture content in the 24- to 48-inch (61 to 122 cm) zone is most critical for pine trees. On plots where all hardwoods were removed, moisture was greatest and pine survival and growth best.

TIMING OF RELEASE TREATMENTS

Anything less than complete removal of hardwoods generally results in the need for a repeat release about 3 years after the initial treatment because of resuppression by hardwood sprouts or by the spreading crowns of hardwoods not treated initially. The use of hand tools to eradicate hardwoods smaller than 4 inches (10 cm) d.b.h. is exorbitantly expensive. Application of silvicides by airplane or by mist blower, however, has made treatment of small hardwoods economically feasible.

Chemical treatment, though desirable, is not always necessary to kill unwanted hardwoods. On dry ridges and upper slopes, blackjack, post, red and black oaks, and hickories have been cheaply killed by girdling. Sprouting on dry sites is not nearly as prevalent as on the lower slopes and in minor bottoms. Sprouting of girdled trees 12 inches (30.5 cm) and more in diameter is negligible and can be disregarded.

If release is delayed several years after regeneration, the young pines may suffer more damage from the falling of the disintegrated overstory than they would if released when 1 year old. During the first 3 years following planting, and immediate release, falling hardwoods damaged about 10 percent of the underplanted loblolly, but killed less than 1 percent of the damaged pines.

COMBINED EFFECTS OF TIMING AND MOISTURE

Few will argue with the practicality of release cutting, but the following example emphasizes the importance of immediate release. In the northern Mississippi study, concerned with the soil moisture aspects of release, the increase in height during the first 5 years, as a result of early intensive hardwood control, indicated a potential harvest of one additional pulpwood stick per tree. Even more important is the 1-inch (2.5 cm) gain in diameter growth. These early growth

Table 2. – Survival and growth of released and unreleased pines.

Species	Released					Unreleased				
	D.B.H.		Height		Survival	D.B.H.		Height		Survival
	inches	cm	ft.	m	(percent)	inches	cm	ft.	m	(percent)
Loblolly	4.6	11.7	23.5	7.2	56	1.5	3.8	10.7	3.3	45
Slash	3.8	9.7	21.6	6.6	17	0.7	1.8	6.6	2	14
Shortleaf	2.8	7.1	14.3	4.4	54	0.5	1.3	5.0	1.5	46
Longleaf	2.1	5.3	12.5	3.8	8	–	–	0.4	0.1	4

advantages could mean an increased harvest per acre of 5 cords (3.6 cu. m) of pulpwood or 3,000 board feet (International ¼-inch log rule) or both, depending upon the rotation used.

Complete and immediate release is, without doubt, most effective and economical over the long haul. Even so, somewhat belated release cutting can greatly increase the productivity of many thousands of acres of small oak-pine and oak-hickory forests.

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